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July 30, 2004

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street SW
Washington DC 20554

**Re: ET Docket No. 03-237, *Interference Temperature Metric*
*Ex parte Communication***

On behalf of the Fixed Wireless Communications Coalition (FWCC), and pursuant to Section 1.1206(b)(2) of the Commission's Rules, I am electronically filing this notice of an oral *ex parte* communication.

Yesterday Dennis Guill and Dennis Gross of Alcatel, Chris Hardy and Will Perkins of Comsearch, Liliana Ward of this firm, and I, all on behalf of the FWCC, met with Ed Thomas, Bruce Franca, and Gary Thayer of the Office of Engineering and Technology to discuss the above-referenced proceeding.

A copy of our presentation outline is attached.

If there are any questions about this filing, please call me at the number above.

Respectfully submitted,

Mitchell Lazarus
Counsel for the Fixed Wireless
Communications Coalition

cc: Meeting participants

Interference Temperature Metric ET Docket No. 03-237

Fixed Wireless Communications Coalition
at
Office of Engineering and Technology

July 29, 2004

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- **Fixed Service applications at 6525-6700 MHz and 12.75-13.25 GHz include:**
 - public safety (e.g., backhauling police and fire dispatch)
 - coordinating railroad trains
 - controlling natural gas and oil pipelines
 - regulating the electric grid
 - backhauling wireless telephone traffic
- **Many applications require 99.999% availability**
 - some meet 99.9999% (30 sec. or less outage per year).

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- FS links often operate with high levels of signal margin
 - **users need that margin to maintain reliability under fading conditions**
 - **users pay for the margin in equipment costs**
- ***FS fade margin is not a public resource the FCC can allocate to others.***

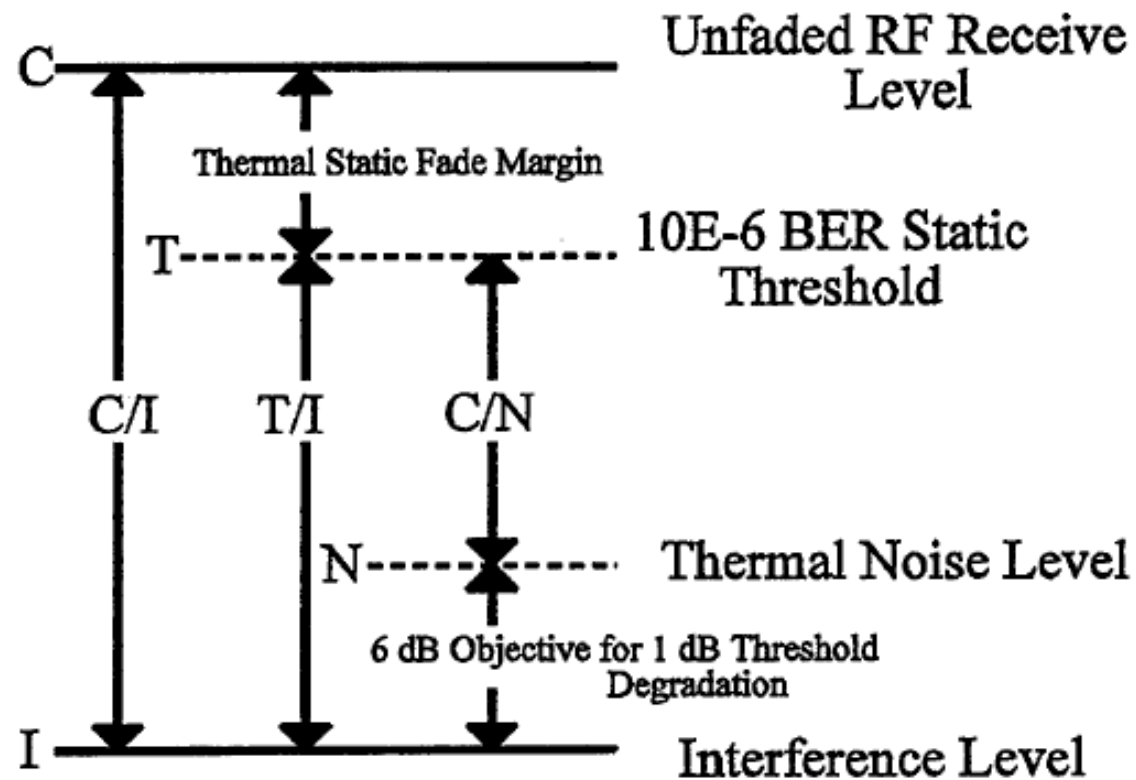
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Ground rules of present FS – FS interference analysis:

- FS Systems must use high-order digital modulation schemes to meet FCC bandwidth efficiency rules
 - at 6 GHz: 4.5 bits/sec/Hz
- Considering fade margin requirements and high-order modulation, C/I Objectives of FS receivers are 55 to 75 dB
- Aggregate interference should degrade FS receiver threshold by no more than 1 dB
- Interference must be 6 dB below receiver thermal noise power level
- ***Frequency coordinators routinely apply these criteria.***

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FS Interference Objectives from TIA TSB-10F:



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Interference Example (1):

● Unlicensed device off the antenna axis:

- 64-QAM needs ~30 dB C/I (not counting fade margin)
 - required by FCC spectrum efficiency rules
- assume unlicensed device at 100 meters (as in NPRM), off axis with 40 dB attenuation relative to boresight
- typical FS receive level is -35 dBm
- allowing 50 dB C/I Objective (~20 dB fade margin), maximum unlicensed signal acceptable at receiver input is -85 dBm
- free-space loss at 100 meters is 89 dB
- unlicensed EIRP **for one unit** limited to 4 dBm, far below the 30-36 dBm in the NPRM.

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Interference Example (2):

- **Unlicensed device in the boresight:**

- Phoenix, AZ, 8 foot diameter antenna on Thompson Peak, gain 42 dBi, 3 dB beamwidth 1.3 degrees, 24 km from Phoenix population center
- this antenna “sees” an area of 1.2 square km
- ***a single one-watt device anywhere in this area reduces the fade margin by more than 30 dB***
- unacceptably reduces reliability for critical applications.

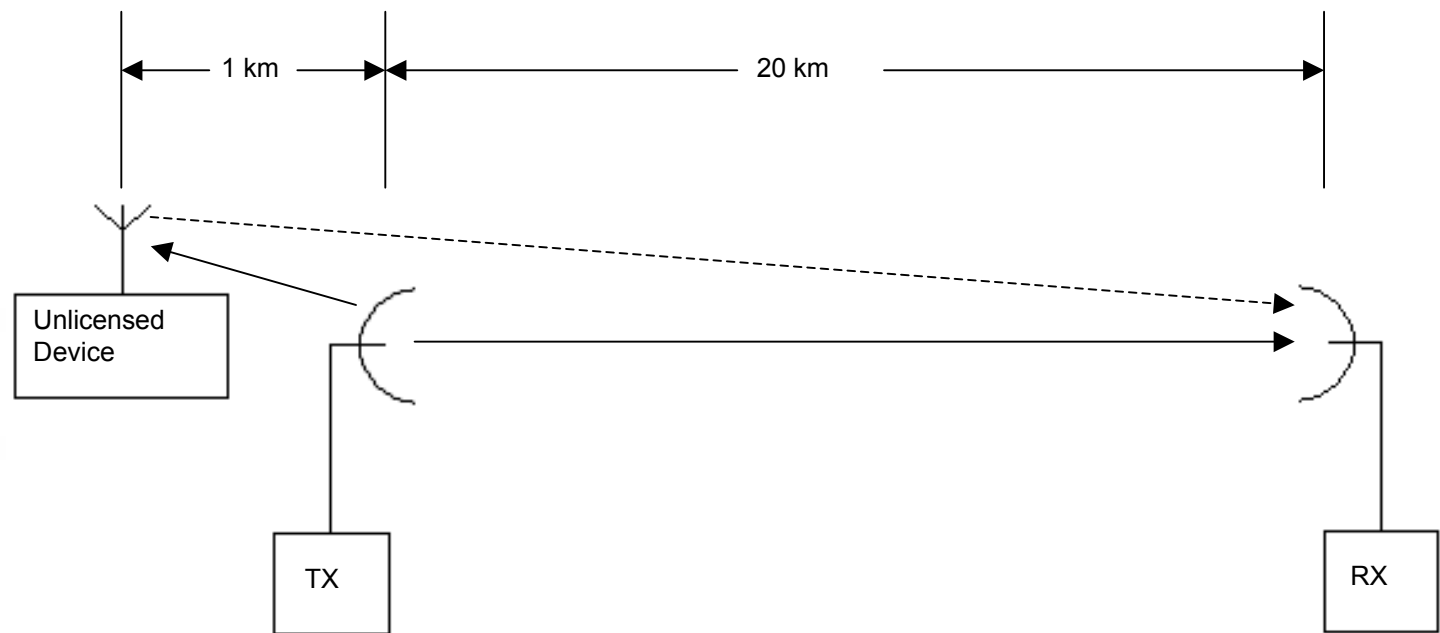
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Dynamic Frequency Selection

- Dynamic Frequency Selection as proposed in the NPRM does not properly identify sharing opportunities
- There is ***no connection*** between the level an unlicensed device receives from an FS transmitter and the interference that device's transmissions may cause to the associated FS receiver
- Following examples illustrate.

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Case 1: Unlicensed Device behind FS transmit antenna,
In main beam of FS receive antenna



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Case 1 Results

- Unlicensed device detects -115 dBm from FS transmitter
- Meets proposed -64 dBm DFS detection threshold criterion by 51 dB
- Unlicensed device transmits 36 dBm EIRP causing interference level of -63 dBm at FS receiver
- Interference reduces FS receiver fade margin from 39 to 2.9 dB and reliability from 99.9999% to 96%

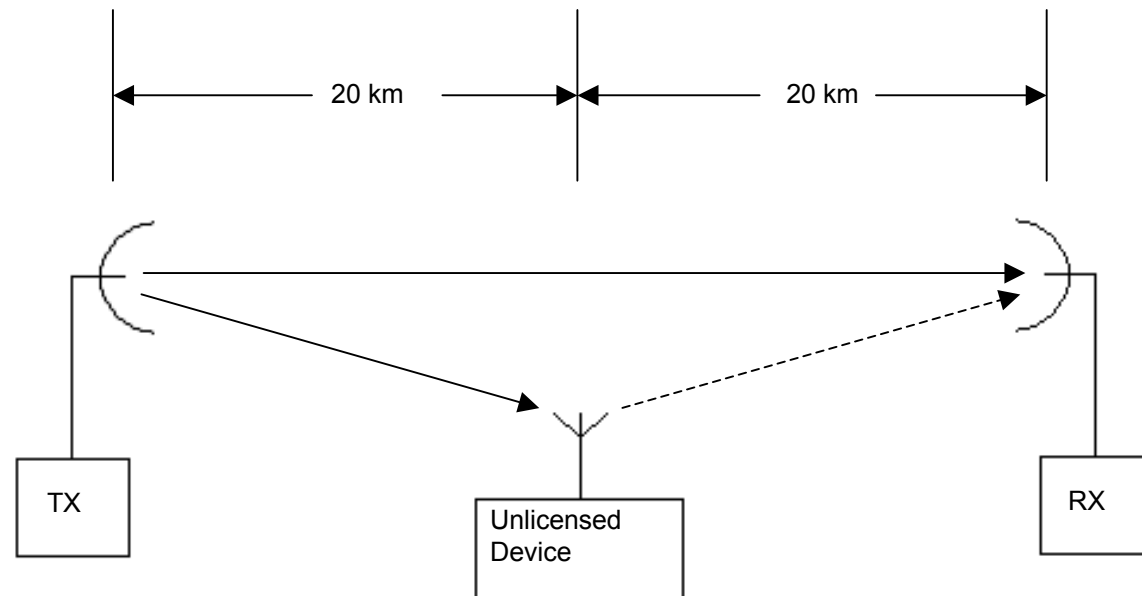
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Case 1 Link Budget

Frequency (GHz)	6.7
FS Transmitter Power (dBm)	27
FS TX Station Fixed Losses (dB)	3
FS TX Antenna Mainbeam Gain (dBi)	39.5
FS EIRP (dBm)	63.5
FS TX Antenna Discrimination to Unlicensed Device (dB)	70
Distance - FS Transmitter to Unlicensed Device (km)	1
Free Space Path Loss - FS Transmitter to Unlicensed Device (dB)	109.0
Signal Level - FS Transmitter at Unlicensed Device Ref to 0 dBi (dBm)	-115.5
Meets -64 dBm DFS Threshold Criterion by (dB)	51.5
Unlicensed Device Transmitter Power (dBm)	30
Unlicensed Device Antenna Gain (dBi)	6
Unlicensed Device EIRP (dBm)	36
Distance - Unlicensed Device to FS Receiver (km)	21
Free Space Path Loss - Unlicensed Device to FS Receiver (dB)	135.4
FS RX Antenna Mainbeam Gain (dBi)	39.5
FS RX Antenna Discrimination to Unlicensed Device (dB)	0
FS RX Station Fixed Losses (dB)	3
Interference Level - Unlicensed Device at FS Receiver (dBm)	-62.9
FS Interference Objective for 1 dB Threshold Degradation (dBm)	-105.0
Interference Level Misses Objective By (dB)	42.1
Distance - FS Transmitter to FS Receiver (km)	20
Free Space Path Loss - FS Transmitter to FS Receiver (dB)	135.0
FS Carrier Level (dBm)	-35.0
FS Required C/(N+I) @ 10 ⁻⁶ BER (dB)	25
FS Receiver Threshold @ 10 ⁻⁶ BER (dB)	-74.0
FS Fade Margin w/o Interference (dB)	39.0
FS Reliability w/o Interference - Average Propagation Conditions (%)	99.99990
FS RX Thermal Noise Power plus Interference (dBm)	-62.9
Degraded FS Receiver Threshold with Interference (dBm)	-37.9
FS Fade Margin with Interference (dB)	2.9
FS Reliability with Interference (%)	95.93050

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Case 2: Unlicensed Device mid-path in main beam of both FS transmit and receive antennas



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Case 2 Results

- Unlicensed device detects -69 dBm from FS transmitter
- Meets proposed -64 dBm DFS detection threshold criterion by 5 dB
- Unlicensed device transmits 36 dBm EIRP causing interference level of -60 dBm at FS receiver
- Interference renders FS link unavailable

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Case 2 Link Budget

Frequency (GHz)	6.7
FS Transmitter Power (dBm)	27
FS TX Station Fixed Losses (dB)	3
FS TX Antenna Mainbeam Gain (dBi)	42.3
FS EIRP (dBm)	66.3
FS TX Antenna Discrimination to Unlicensed Device (dB)	0
Distance - FS Transmitter to Unlicensed Device (km)	20
Free Space Path Loss - FS Transmitter to Unlicensed Device (dB)	135.0
Signal Level - FS Transmitter at Unlicensed Device Ref to 0 dBi (dBm)	-68.7
Meets -64 dBm DFS Threshold Criterion by (dB)	4.7
Unlicensed Device Transmitter Power (dBm)	30
Unlicensed Device Antenna Gain (dBi)	6
Unlicensed Device EIRP (dBm)	36
Distance - Unlicensed Device to FS Receiver (km)	20
Free Space Path Loss - Unlicensed Device to FS Receiver (dB)	135.0
FS RX Antenna Mainbeam Gain (dBi)	42.3
FS RX Antenna Discrimination to Unlicensed Device (dB)	0
FS RX Station Fixed Losses (dB)	3
Interference Level - Unlicensed Device at FS Receiver (dBm)	-59.7
FS Interference Objective for 1 dB Threshold Degradation (dBm)	-105.0
Interference Level Misses Objective By (dB)	45.3
Distance - FS Transmitter to FS Receiver (km)	40
Free Space Path Loss - FS Transmitter to FS Receiver (dB)	141.0
FS Carrier Level (dBm)	-35.4
FS Required C/(N+I) @ 10^{-6} BER (dB)	25
FS Receiver Threshold @ 10^{-6} BER (dB)	-74.0
FS Fade Margin w/o Interference (dB)	38.6
FS Reliability w/o Interference - Average Propagation Conditions (%)	99.99910
FS RX Thermal Noise Power plus Interference (dBm)	-59.7
Degraded FS Receiver Threshold with Interference (dBm)	-34.7
FS Fade Margin with Interference (dB)	-0.7
FS Reliability with Interference (%)	-

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Summary of Cases 1 and 2

	Level of FS Transmitter at Unlicensed Device	Interference Level of Unlicensed Device at FS Receiver
Case 1	Low	High
Case 2	High	High

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Outcome:

- Dynamic Frequency Selection as proposed does not work in the presence of highly directional antennas
 - **unlicensed devices cannot monitor to determine safe power levels**
- FS 6 GHz band antennas are usually six or eight feet in diameter and highly directional
 - **high gain enables FS receivers to receive signals far too faint for detection by a smaller-sized monitoring device**
 - **the unlicensed device would miss and override the weak FS signal and cause harmful interference.**
- Setting DFS threshold low enough and/or EIRP limits low enough to protect FS may not allow for viable unlicensed underlay service.

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Conclusion:

- Unlicensed devices that rely on Dynamic Frequency Selection cannot share spectrum with highly directional, highly sensitive FS systems that require high reliability to handle critical infrastructure and public safety communications.

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Thank you!

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